Nutrition News

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CALCIUM AND PHOSPHORUS METABOLISM IN YOUNG WOMEN

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Although calcium and phosphorus metabolism in all age groups has been extensively investigated, interest has centered largely around the needs of the growing child and young adult. Of particular importance is a thorough understanding of the mineral requirements of young women, since a large percentage will soon assume responsibilities of marriage and motherhood.

Since World War II there has been a marked trend toward earlier marriage in this country. In 1951 nearly 18 per cent of girls between the ages of 15 and 19 years were or had been married, as compared with 12 per cent in 1940, according to statistics published by the Metropolitan Life Insurance Company. At ages 20 to 24, the increase was from 53 per cent in 1940 to 69 per cent in 1951. This trend in early marriage is accompanied by a trend toward early motherhood. In 1953, 10 percent of all infants were born to mothers under 20 years of age, and 30 per cent to mothers between the ages of 20 and 24 years.

That many young women approach the high requirements of the reproductive years with relatively low reserves of calcium and phosphorus would seem to be evident from the observation of the late T. Wingate Todd. He observed that low mineralization of the skeleton occurs with surprising frequency among adolescents. Furthermore, numerous dietary surveys indicate that young women in late adolescence and early adulthood continue to consume amounts of calcium which are not adequate for optimum storage.

Studies, carried out for the most part on lower animals, have shown that many factors influence calcium absorption, retention and urinary excretion. The results of such studies are of questionable value as a basis for understanding the functioning of the human body. The similarity between the diets of the human and the rat would suggest the suitability of this animal for studies designed to clarify some of the problems in human metabolism. However, man's low efficiency in the utilization of dietary calcium as compared with that of the rat prevents direct application of findings from rat studies to man.

Human Studies

Calcium and phosphorus balance studies in which college women served as experimental subjects have been conducted in a number of nutrition laboratories. In general, these show that individuals vary widely in their ability to utilize dietary sources of these elements. Some women require much higher intakes for equilibrium than others.

One such study on 124 women on self-selected diets [1] showed that calcium losses were more frequent than retentions when intakes averaged less than 0.8 gram calcium per day. Phosphorus losses were more frequent than retentions when the intake was less than 1.1 grams phosphorus per day. At higher intake levels, the percentage of individuals storing these minerals increased fairly consistently as the level of intake increased. The lower levels of 0.8 gram calcium and 1.1 grams phosphorus, therefore, would appear to represent the minimal quantities of calcium and phosphorus necessary for maintenance in young women.

The composition of the diet with respect to its content of other essential nutrients also influences efficiency of calcium utilization. In the above cited study dietary calcium was better utilized when the subjects were consuming a well-selected, controlled diet than when they were on their customary self-chosen and less adequate diet.

The ratio of calcium to phosphorus and the amount of vitamin D in the diet have been shown to be factors in the development and cure of rickets in both experimental animals and young children. A study was made on the effect of varying the ratio of calcium to phosphorus on the utilization of these minerals. [2] It was found that, at each level of calcium intake, increasing the phosphorus intake did not result in a significant increase in calcium retention. However, at each level of phosphorus intake, an increase in calcium resulted in a significant increase in calcium storage.

Dr. Leichsenring

Although there was some evidence in another study that high levels of phosphorus intake interfered with calcium utilization, in general it appears that in young adults, amounts of dietary calcium are of more significance in determining calcium balance than the ratio of calcium to phosphorus.

Other inter-relationships have been investigated, but much additional research is needed for the complete clarification of calcium and phosphorus metabolism in human subjects. Meanwhile, our present knowledge justifies and urges forceful nutrition education with adolescent girls and young women. Emphasis appears needed on generous use of our most abundant food sources of calcium, especially milk, but in diets which are adequate also in all other known essential nutrients.

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[1] McKay, Patton, Ohlson, et al. Calcium, phosphorus and nitrogen metabolism of young college women. J. Nut. 24:367, 1942.

[2] Patton, Wilson, Leichsenring, et al. The relation of calcium-to-phosphorus ratio to the utilization of these minerals by 18 young college women. J. Nut. 50:373, 1953.

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Glances AT NUTRITION RESEARCH

Exhaustive biological research continues to provide the facts on which future industrial and medical practices will be based to the benefit of mankind. Industry will develop the needed products for medical prescription and administration.

Casein utilized most efficiently—Less energy is required to maintain positive nitrogen balance when whole casein is fed than when equivalent total nitrogen and all essential amino acids are fed in purified form. Only 35 calories per kilogram of body weight per day maintained young men in positive nitrogen balance when whole casein was fed. However, 45 or more calories per kilogram body weight per day were required to maintain positive balance in the same subjects when acid or enzyme hydrolyzed casein or pure amino acids were fed.

—*J. Biol. Chem. 210:331 (Sept.) 1954*

Pasteurization and homogenization—Milk is not adversely affected by either pasteurization or homogenization. This was demonstrated by measuring growth, reproduction, and lactation performance in rats fed mineralized whole milk through three generations. Milk from a common source was used. It was fed as the raw, pasteurized, and homogenized products. The study revealed no seasonal differences in nutritive value of milk. Other studies showed dried whole milk and sterilized milks support excellent growth in rats.

—*Ag. and Food Chem. 2:978 (Sept.) 1954*

Lactose formed from butyric acid—The formation of lactose from butyric acid has been demonstrated. Butyrate containing radioactive carbon was injected in the jugular vein of lactating cows. Up to 22 percent of the radioactive carbon appeared in organic milk constituents. More appeared in lactose and casein than in milk fat. Preferential conversion of this fatty acid into milk protein and sugar is particularly interesting since milk fat contains more butyric acid than does any other commonly used dietary fat.

—*J. Biol. Chem. 210:239 (Sept.) 1954*

Virus destruction by heat—The temperatures used in the pasteurization of milk (143° F. for 30 minutes or 160° for 15 seconds) were shown to be adequate to inactive heavy cultures of human and mouse-passaged Coxsackie viruses. Pasteurization temperatures used for ice cream (155° F. or more for 30 minutes) were shown to be adequate to inactivate the same viruses suspended in ice cream. Pasteurization temperatures used for milk were found capable of inactivating the human viruses in cream.

—*Amer. J. Public Health 44:1174 (Sept.) 1954*

TIMELY TOPICS

Dr. Leichsenring

Dr. Leichsenring is a member of the research and teaching staff of the School of Home Economics, University of Minnesota. She was awarded the Borden Award for Fundamental Research in the field of Nutrition and Experimental Foods for 1954. Her contributions in research have included mineral metabolism and hematological studies, food analysis studies and dietary investigations. She is joint author of the widely used food composition tables for a short method of dietary analysis, and author of over 50 scientific papers and research publications.

School Milk Program

The special school milk program designed to increase the use of milk by school children has been established rapidly. By November 1, plans of 45 states and the District of Columbia had been approved. Federal funds of $50 million annually for two years are provided, separate from those of the school lunch program but administered through the same channels, to reimburse schools for milk used by children over and above that used last year.

Milbank Memorial Fund

The Milbank Memorial Fund was founded in New York City in 1905 for the purpose of "improving the physical, mental and moral conditions of humanity." It sponsors research in a number of areas, such as nutrition, public health and mental illness. Its work in the identification of nutritional deficiency signs has been a primary contribution. Research is reported in the Milbank Memorial Fund Quarterly.

A NUTRITION PROGRAM FOR THE SMALL BUSINESS OR INDUSTRY

By Helen A. Reischl, R. N., Industrial Nurse Consultant
Employers Mutuals of Wausau, Milwaukee, Wisconsin

Establishing a nutrition program for those employed in our smaller businesses and industries is not as simple as educating management in the significance of nutritional health of employees. If it were, I believe greater advances would have been made these past ten years.

Our newspapers, trade publications, and periodicals have given considerable space to sound nutritional practices for our adult population. Many modern business executives are cognizant of the merits of sound nutrition in achieving and maintaining optimum physical and mental stamina for employees. Why then, have we not had more emphasis on opportunities for sound nutrition practices in many small establishments?

In reviewing Department of Commerce statistics, we note that 99% of all business firms in the United States employ less than 100 people. Most of these have no type of health program nor do they employ any one person who has the knowledge, time and interest required to develop an effective nutrition program. Although many of these businesses and industries have some type of in-plant food service, foods served are usually accession to requests from the employee group. These considerations would not concern us if we knew our workmen consumed adequate diets. Unfortunately, the opposite frequently is true. The 9:00 A.M. lunch wagon sells relatively little fruit juice. Soft drink machines outnumber milk vending machines by far.

We cannot rely on education of the employer and employee alone. We cannot disturb eating habits to the extent that employees become antagonistic. In looking about for more positive approaches, I believe we need to seek the assistance of our industrial caterers to carry out applied nutrition and educational programs in the small plants they serve. It is of primary importance that they improve the contents of their box lunches as well as the nutritional value of the hot food served. While serving, they could present before the workers some valuable information on the nutritive value of the foods on the menu. By means of clearly interpreted graphs and bar charts, calorie count and chief nutrient content of the foods served could be displayed on the food counter. Thus, highly nutritious foods and food combinations could have new appeal. The sales technique of display so effectively used at the department store cosmetic counter could create new interest in nutritious food combinations and increase food sales for the caterers. The worker too becomes a beneficiary.

I know of one small industry where the caterer and his wife, who manage the plant cafeteria, have doubled their milk sales. Above the refrigerated unit, they placed a colored chart graphically illustrating the food value of one glass of milk.

A low-calorie luncheon is served for those watching their waistlines. For several weeks the employees ignored the low-calorie diets, but when several executives became daily patrons at that counter many overweight employees were motivated. With employee and management interest this caterer is bound to renew his contract. Does he wish to renew it? Of course he does—sales are climbing!

The small plant nutrition program is a real challenge to industrial caterers. Whether there be a cafeteria, lunch counter, or rolling cart matters little. The important consideration is that the caterers who frequently serve a group of the smaller industries or businesses, employ someone who has a technical understanding and background of nutrition, or seek guidance from the agencies who will help with the implementation of such a program. With factual knowledge at their disposal, the objectives of a well-rounded nutrition program could be achieved for our small industries.

CHICK-FEEDING EXPERIMENT TEACHES NUTRITION TO CHILDREN

By Martha Potgieter, Ph.D.
Associate Professor of Foods and Nutrition, University of Connecticut

A feeding experiment with young small animals can provide an impressive nutrition lesson for children. Such a project can be conducted by sixth-grade children with little assistance from their teacher.

One hindrance in conducting an animal experiment in school is care of animals on weekends. To overcome this obstacle, a five-day chick-feeding project was devised, in cooperation with sixth-grade children in several Connecticut schools.

Chicks were used because they respond much more quickly to changes in diet than do rats or guinea pigs.

Two or three chicks should be used on each of the two diets. It is best to use ten-day-old chicks that have previously been on a good chick ration. Younger chicks may die on the poor diet; the better development of older chicks will prevent any conspicuous retardation in five days.

Two cages can be made by the children out of hardware cloth and four inexpensive pie tins. Small cold-cream jars for food and water, newspapers and sand to place under the cages daily, and most of the foods for the diets can be brought by the children.

The two experimental diets should be quite different in nutritive value if differences in growth and well-being are to be plainly noticeable in five days. It is best to let the children plan the diets, with guidance from teacher, school nurse, or nutritionist. Diets of familiar foods will have greater educational value for the children than synthetic diets. The selection may be based on some local dietary problem, such as poor breakfast habits. One group might be fed unenriched white bread and crackers, jelly and coffee, the other group enriched or whole-grain cereals and bread, milk, fruit, and egg. All foods and liquids should be at room temperature when fed and liquids should be put into cups so small that the chicks cannot stand in them. Wet feet can inhibit eating and growth in young chicks. They should be given fresh food and water two or three times a day and both groups should have food and water in their cages at all times. The foods fed should be cut up into very small pieces or cooked or moistened to pro-

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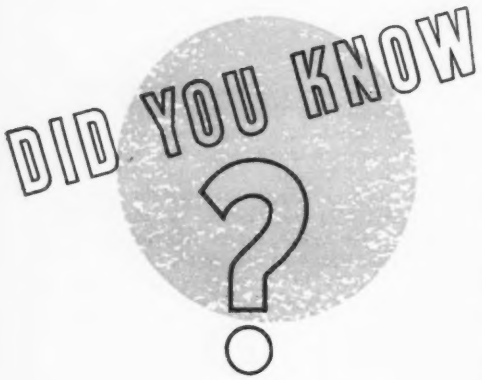

—that anthropologists credit the increase in height of the average American man to improved diet and the tendency for tall individuals to select tall mates?

—that fluoridation of drinking water was started in the thousandth town, Osawatomie, Kansas, this summer and that fluoridated water is now available to some eighteen million people?

—that Americans ate about five and one-half billion pints of ice cream, sherbet and other frozen dairy foods last year, the second highest amount ever recorded?

—that milk is considered the most suitable carrier for vitamin D fortification because of milk's content of calcium and phosphorus, both requiring vitamin D for utilization in the body?

—that the Norwegians were the leading per capita consumers of cheese last year, using 17.9 pounds per person?

—that food preferences of the Royal Canadian Airforce members show, in recent years, an ever-increasing demand for milk, vegetables, salads, fresh fruits and fruit juices?

—that the dairy cow is the most efficient producer of calcium of any animal species, producing ten times as much as the hen, its nearest competitor, in terms of converting calcium intake to calcium produced?

THINGS YOU'LL LIKE TO READ

Roberts' Nutrition Work With Children —Ethel Austin Martin. The University of Chicago Press, Chicago. 1954. $7.50.

The publication of ROBERTS' NUTRITION WORK WITH CHILDREN by Ethel Austin Martin is welcomed by all concerned with the well-being of children. The book, first published in 1927 and revised in 1935, has long been recognized as an outstanding source of information in the area of child nutrition. Mrs. Martin, who was associated with Dr. Roberts at the University of Chicago and assisted in the initial writing of the book, undertook the revision at Dr. Roberts' request.

Basic appeals of the book are the thorough treatment of the subject and the wealth of information that has been collected in one volume. These characteristics of the original text have been carefully retained. Advances in the science of nutrition, new studies of growth and development, and the increasing awareness of our responsibility to the world's children have necessitated extensive changes.

Content is presented in two major areas. Chapters I-VIII deal with the implications of nutrition for children. The remaining chapters are devoted to programs designed to help children become and remain well-nourished.

Notable examples of the information in the first area are the chapters, "How does a child grow?" and, "How do you know when a child is growing normally?"

The author introduces the second area with a description of the organizations and agencies which contribute to the well-being of children. She describes suggested approaches for teaching nutrition at different grade levels, a sound school nutrition program and the school lunch. The book is completed with a comprehensive discussion of aids available for teaching nutrition and ways to evaluate and use them.

The book is well-organized both as a comprehensive reference and for convenient use of portions of special interest to varied groups.

CHICK-FEEDING EXPERIMENT

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vide a satisfactory consistency for the chicks. Diets selected should be closely followed, without variation. Feeding should be supervised at all times to avoid error. Some children may feel sorry for the chicks on the poor diet and wish to feed them stealthily.

Use a gram scale to weigh the chicks in order to show the slight day-to-day weight changes. If no gram scale is available, a common household scale can be used. In this case, each group of animals on one diet should be weighed together and the group gains and differences noted. Young animals may sometimes lose weight the first day even on a good diet, because of changes in diet and environment.

The children in the Connecticut schools found that their chicks on the good diet gained an average of thirteen grams each and those on the poor diet, an average of six grams. This difference was plotted on cross-section paper. The chicks on the good diet developed normally, were tame and friendly. The chicks on the poor diet appeared definitely inferior in health and well-being. Feathers were lighter in color and posture was poor. They squawked continually, lost interest in food, and pecked at the children's hands.

An impressive end to the project was seeing the poorly fed chicks eat greedily when given oatmeal, enriched white or brown bread, milk and hard-cooked egg. The chicks usually were taken home by some of the children. The slow but eventual recovery of those that had had the poor diet was noted by all.

This experiment can be a forceful means of teaching children the effects of good and poor combinations of food on health. It should be stressed that combinations rather than specific foods make diets good or poor.

Adverse criticism to such use of animals may be avoided by keeping the public informed, through newspapers, radio and PTA meetings, of the purpose and outcome of the experiment. The publicity will also arouse community interest and the educational benefits can be far-reaching.